

new figures to meet this objection. They will be submitted promptly upon completion.

Rejections under 35 U.S.C. §103

Claims 1-3 have been rejected under 35 U.S.C. §103(a) as being unpatentable over JP '204 (JP 62-191204) in view of Lucas '211 (US Patent No. 5,967,211), JP '603 (JP 3-258603) and further in view of Midorikawa '784 (Canadian Patent No. 2,049,784) or JP '214 (JP 10-129214). This rejection is traversed for the following reasons.

Present Invention

The present invention discloses a studless tire having non-metal staple fibers with an average fiber diameter of 1 to 100 μm and an average length of 0.1 to 5 mm. The fibers are dispersed in a diene rubber in such a way that the non-metal staple fibers are oriented in a thickness direction of a tread, a complex elastic modulus E_1 in the thickness direction of the tread and an elastic module E_2 in a circumferential direction of the tire. The tire when measured at 25°C satisfies the equation $1.1 \leq E_1/E_2 \leq 4$, and a hardness of the tread rubber measured at -10°C is 45 to 75 degrees.

Application No.: 09/627,424

Disclosure of JP '204

JP '204 discloses a skid-proof tire that is comprised of 5 to 60 parts by weight of an anti-slip agent such as organic fibers, glass, carbon, ceramics, or metal, which is blended in with 100 parts by weight tread rubber. The anti-slip agent is exposed to the outer surface of the tread rubber. The anti-slip agent is composed of short filament-like fibers arranged orthogonal to the outer surface of the tread. The tire reduces dust generation.

Disclosure of Lucas '211

Lucas '211 discloses a tire with a rubber tread reinforced with silica and containing one or more additives designed to aid ice traction for the tread. The additive is selected from at least one of (i) at least one organic fiber having hydroxyl groups on the surface thereof selected from cellulose fibers and wood fibers and (ii) small, hollow, spherical ceramic particles having silanol groups on the surface thereof. The rubber is composed of at least one or more diene-based sulfur vulcanizable elastomers having a Tg of less than -30° C and containing silica as predominant particulate reinforcement and other traditional rubber compound ingredients. In particular, a coupler is used

to couple the silica as well as the said additive(s) to the elastomer(s) in the tire tread composition.

Disclosure of JP '603

JP '603 discloses a pneumatic tire for driving on icy roads with fiber bundles buried in the tread rubber. The rubber does not penetrate into the bundle core, and the ends of the fibers are exposed on the tread surface. The hardness of the tread rubber is between JIS 45 and JIS 50.

Disclosure of Midorikawa '784

Midorikawa '784 discloses a studless pneumatic tire which comprises a tread compound formed from a cellular rubber and short fibers of a specified average length and a specified average diameter distributed and specifically oriented within the cellular rubber which has a selected set of physical properties.

Removal of JP '204 in view of Lucas '211, JP '603 and further in view of Midorikawa '784 or JP '214

The Examiner implies that it is possible to achieve the instant invention simply by orienting short fibers so that they are orthogonal to the surface of the tread. Applicants

disagree. It is impossible to achieve an $E1/E2$ ratio of 1.1 to 4 merely by orienting the short fibers such that they are orthogonal to the tauter surface of the tread.

For example, although JP '204 discloses a preferable amount of short fibers that is at least 5 parts by weight to at most 64 parts by weight, Comparative Example 4 of the present specification, where 30 parts by weight of glass fibers is compounded, has brought an unfavorable result of $E1/E2$ of 4.15. Furthermore, $E1/E2$ values are likely to change depending on the material of short fibers, the average fiber length, the average fiber diameter, and combination thereof.

The present invention has been completed based on a synergistic effect obtained by adjusting $E1/E2$ to 1.1 to 4 and by using a tread rubber having a hardness of 45 to 75. The synergistic effect is clearly shown in Examples of the present specification. Specifically, an $E1/E2$ ratio of 1.1 to 4 means that the short fibers are oriented orthogonal to the outer surface of the tread; when the value is at most 1.1 as in Comparative Example 3, the scratching effect by short fibers cannot be expected. Thus, remarkable improvement of tire performances on icy or snowy road cannot be achieved.

Additionally, when the value is at least 4 as in Comparative Example 4, the performance on icy or snowy roads

becomes inferior because the rigidity on the tread surface becomes too large. Furthermore, even if the short fibers are oriented radially to the outer surface of the tread (E_1/E_2 being 1.1 to 4), the improvement effect regarding the tire performance on icy or snowy road decreases when the hardness of the tread rubber is increased too much. When the hardness is too small, the abrasion resistance is also remarkably decreased.

Accordingly, as should be apparent from the above description, it is necessary to keep a balanced relationship between E_1/E_2 ratio and hardness. Excellent controllability as well as abrasion resistance on icy or snowy road can be achieved only when both elements are satisfied as in Examples 1 and 2.

Applicants submit that the disclosures of JP '204, Lucas '211, JP '603, Midorikawa '784, and JP '214 do not disclose or suggest carefully adjusting the E_1/E_2 ratio and the hardness to generate this unexpectedly superior effect. Accordingly, withdrawal of the rejection is warranted and respectfully requested.

With the above remarks, it is believed that the claims, as they now stand, define patentable subject matter such that a passage of the instant invention to allowance is warranted. A Notice to that effect is earnestly solicited.

Application No.: 09/627,424

If any questions remain regarding the above matters, please contact Applicant's representative, Joseph A. Kolasch, in the Washington metropolitan area at the phone number listed below.


Pursuant to the provisions of 37 C.F.R. §§ 1.17 and 1.136(a), the Applicants hereby petition for an extension of two (2) months to May 5, 2002 in which to file a reply to the Office Action. The required fee of \$400.00 is enclosed herewith.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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